

Ser. No. 09/446,144

Attorney Docket No.: 218728-00059

PATENT APPLICATION

IN THE  
UNITED STATES  
PATENT AND TRADEMARK OFFICE

In Re U.S. Patent Application )  
Applicant: RUBBLIA et al. )  
Serial No.: 09/446,144 )  
Filed: March 2, 2000 )  
For: NEUTRON-DRIVEN )  
ELEMENT TRANSMUTER )  
Examiner: Green, Jr., Daniel Lawson )  
Group Art Unit: 3641 )

DECLARATION OF YACINE KADI

## DECLARATION OF YACINE KADI

I, Yacine KADI, hereby declare and make the following statements in support of the above-referenced application based upon my personal knowledge, information and belief:

1. I am an applied physicist at CERN (European Organization for Nuclear Research, Geneva) and leading the section which is responsible for the LHC Collimation and Beam Intercepting Devices. I was a former member of the Emerging Energy Technologies Group (a unit dedicated to R&D work on possible future technologies related to energy, e.g. accelerator-driven fusion or fission applications) and headed by Prof. Carlo Rubbia (Noble Prize in Physics, 1984) until 1999. I have been working on the Energy Amplifier project (EA) since 1994, in particular I am responsible for the numerical simulation aspects of the EA and the development of Monte Carlo code systems for nuclear waste transmutation studies (more than 130 publications on the subject in conferences and specialized journals).

I first graduated in 1990 from the Honours School of Nuclear Engineering of the Victoria University of Manchester (UK). I obtained the following year a Master of Engineering degree in Atomic Engineering from the Ecole Nationale Supérieure de Physique in Grenoble (France). After a short stay at Framatome (Lyon, France) where I was employed as a nuclear engineer in the Thermal-hydraulic and Safety Department, I joined the Commissariat à l'Énergie Atomique (Cadarsache, France) to carry out my doctoral studies in the field of accelerator-based transmutation of long-lived radioactive nuclear waste. I visited the Reactor Physics Department of the Paul Scherrer Institute in

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Villigen (Switzerland) and the Institut für Neutronenphysik und Reaktortechnik of the Kernforschungszentrum in Karlsruhe (Germany).

I am regularly involved in consultancies for the International Atomic Energy Agency (Vienna) and the Nuclear Energy Agency of the OECD (Paris) on accelerator-driven systems and thorium based fuel cycles to constrain plutonium and reduce the long-term nuclear waste toxicity. I am a member of the n\_TOF Collaboration at CERN (Neutron Time Of Flight Experiment) where neutron induced cross section measurements are carried out for isotopes of interest in the field of transmutation of long-lived radioactive nuclear waste. I am a member of the Thorium Report Committee set up by the Research Council of Norway to advise on the Energy Amplifier Demonstration Facility and coordinator of the Multi-MW liquid mercury target station design in the framework of the EURISOL Design Study within the EU 6th Research Framework Programme.

2. In making this declaration, I have reviewed: pending patent applications 09/446,144 and 10/985,323, including all of their claims; all of the issued Office Actions and filed responses for pending patent applications 09/446,144 and 10/985,323; and the briefs on appeal and the Decision on Appeal for patent application 09/446,144.

3. The Examiner has stated that "the term transparency is defined to permit the passage of radiation particles"<sup>1</sup> and that Applicant has set forth a repugnant or contrary definition of transparency by defining it as a "property of a medium in which neutrons undergo mostly elastic scattering"<sup>2</sup>. While the Examiner's definition of

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<sup>1</sup> See the paragraph spanning pages 12 and 13 of the Examiner's Answer where he cites a glossary of terms in Nuclear Science and Technology, 1957.

<sup>2</sup> See lines 30-32 of page 2 of the published PCT patent application WO/98/59347.

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transparency is correct, I disagree with the Examiner's statement that the Applicant's definition is repugnant. The mere fact that a definition does not expressly include an element does not mean that the element is repugnant to the definition. Based on a reading of the specification in its entirety, and from my experience, it is clear that Applicant is merely defining a specific type of transparency (i.e., one in which the neutrons still pass through the medium, but in a route or path that is not straight).

4. Furthermore, a diffusing medium in which neutrons undergo mostly elastic scattering is readily understandable to those experienced in this field to mean more than half. Based on my knowledge and experience in this field, I, or, in my opinion, anyone experienced in this field, would be able to create or select a diffusing medium in which the neutrons undergo mostly elastic scattering.

5. It is also my opinion that the disclosure in the application regarding "impurities" is sufficient to enable one to practice the invention. A reading of the entire application makes it clear that the impurities refer to the material or isotopes that are to be activated and not the general content of the diffusing medium. Examples of passages from the application to support this point are as follows:

- "If a small amount of impurity to be activated is added to the transparent medium, it will capture some neutrons." Page 32, lines 10-11.
- "In such a region [i.e., the Activation Region] . . . are embedded the samples to be activated, for instance, inside narrow, thin tubes." Page 53, lines 1-5.
- ". . . transmutation rates are largely independent of the chemical binding and isotopic composition of the materials inserted in the Activator." Page 56, lines 13-15.

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- "Therefore, one can imagine thin, sealed stainless tubes, similar to fuel pins except that they contain  $^{99}\text{Tc}$  in dispersed form of metal wires or equivalent geometry and Iodine vapours at low pressure." Page 81, lines 2-5.

Examples of additional isotopes and material to be activated, as well as the concentrations of the material are set forth in the application in, among other places, tables 1, 3 and 7-9, pages 58-61 and Appendix A, page 92 et seq. In my opinion and from my experience, one experienced in this field, would, upon reading of the application, know what types and concentrations of isotopes or materials that may be used to practice the invention.

6. In my opinion, the presence of such impurities that are distributed or embedded in the diffusing medium does not change that the diffusing medium is transparent as it will be the isotopes or material that capture the neutrons and not the diffusing medium itself.

7. After reviewing the specification and, in view of my experience, it is also my opinion that it is clear that the use of the terms buffer regions or layers with respect to the terms 'inner' and 'outer' refers to the relative position and function of the layers or regions. As disclosed in the application, the first or inner buffer layer or region is positioned around the target, while a second layer or region is positioned outside from the inner buffer layer or region.

8. I make this declaration based on my personal knowledge and belief that the aforementioned terms are readily understood by those knowledgeable in this industry or field.

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9. I declare further that all statements made herein of my knowledge are true; that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or document and any registration resulting therefrom.

Dated: 2 / 10 \_\_\_\_\_, 2007

By: Yacine KADI

Signature:

